

Irrigation Management of Hard Red Spring Wheat

Approximately 40 per cent of total irrigated acreage in southern Alberta was sown to wheat (soft, hard and utility) in 1985. It is a crop which is particularly well adapted to irrigated conditions. Wheat grows on most soils which are well drained. It is a 'cool season' crop. The minimum temperature for growth is about 3 to 4°C, the optimum temperature is about 15 to 20°C, and the maximum temperature is about 30 to 32°C.

The tolerance of hard red spring wheat to soil salinity is a factor of importance for southern Alberta farmers. At the germination and seedling stage, hard red spring wheat tolerance to soil salinity is poor. Once established, its tolerance to soil salinity is fair.

Although wheat is considered primarily a food crop (used for breads, baby foods, breakfast cereals, farine and wheat germ), it has extensive feed and industrial use. Wheat grain is a good livestock and poultry feed when used as part of the ration.

Crop Water Requirements and Crop Yields

In areas where there are no soil restrictions, hard red spring wheat develops an active rooting zone of approximately 1.0 m (3.3 ft). The seeding dates for this crop are generally between April 21 and May 15, with approximately 100 to 105 days needed for the crop to reach maturity. The growing season is approximately from May 10 to August 15, with seasonal crop water use approaching 460 mm (18 in.). Over a 30-day period, maximum crop water use will be 7.0 mm/day (0.28 in./day). During the early stages, water use will range from 1.0 to 3.0 mm/day (0.04 to 0.12 in./day) rising to 7.0 to 7.5 mm/day (0.28 to 0.30 in./day) during the boot to bloom stages. Complete canopy cover occurs during the flowering stage. Hard red spring wheat removes approximately 70 per cent of its water requirements from the top half metre of the root zone.

Water stress injury to grown crops is related to the growth stages at which stress occurs and to the degree of stress imposed. The yield and quality of wheat is decreased by water during the stem extension and early grain filling (soft dough) stages.

Initiation of tillers and stem extension is a critical growth stage for moisture stress. Soil moisture stress during this stage will result in a growth and yield reduction that cannot be overcome by optimum soil moisture conditions during the later stages of growth.

A second critical water requirement period is the flowering to soft dough stage. Limiting water during this period can cause flowers to abort, consequently reducing yield.

Yields of 65 to 75 bu/ac are considered good. Yields of 100 bu/ac have been attained on research plots. Figure 1 illustrates the relationship between water consumption and yield for hard red spring wheat.

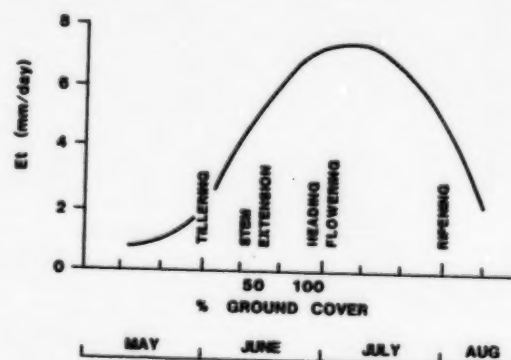


Figure 1. Crop water use of hard red spring wheat during the growing season.

Comments

Like other cereal crops, the amount of irrigation water and the amount of nitrogen fertilizer applied, affect both the yield and protein content of hard wheat. Hard wheat producers attempt to keep the protein content above 13.5 per cent to obtain a high protein premium. Adding more irrigation water increases the yield, but reduces the protein content. Adding more nitrogen fertilizer will increase both the yield and protein content. The irrigated wheat producer should match his nitrogen fertilizer application to his ability to supply irrigation to the crop.

For cereal crops, soil surfaces should be allowed to dry out between irrigation intervals to reduce the potential buildup of diseases. Heavier applications of water (75 mm) versus lighter applications of water (25mm) are preferred.

The timing and amount of water applied for the last irrigation is critical for optimum production. Producers

should ensure that sufficient water is available for the crop to mature, yet limit irrigation before the hard dough stage to reduce the potential for disease. A late irrigation may delay maturity and increase risk of frost damage.

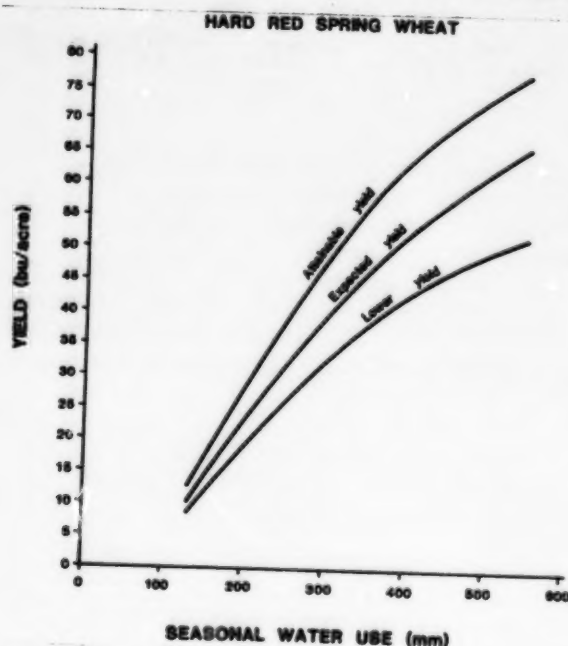


Figure 2.

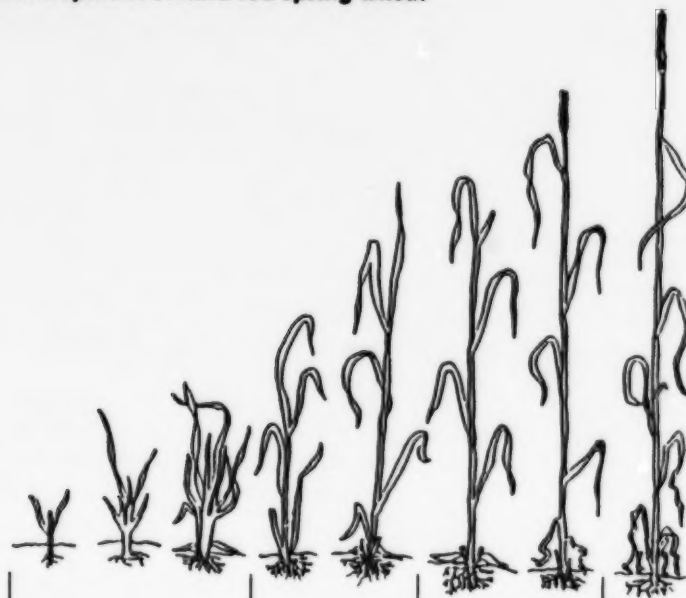
Timing of the last irrigation is also important in relation to sprinkler system capabilities. Since the side wheel roll irrigation system is limited by crop height, a final irrigation should be made when the irrigation system is still capable of crossing the entire field. This may involve irrigating sooner than the 50 per cent allowable depletion level but will ensure sufficient water is available to meet the needs of the crop.

After harvest, soil moisture conditions tend to be at their lowest point. To ensure good soil moisture conditions for the following spring, fall irrigation is recommended. Fall irrigation should take place when the amount of soil moisture is less than the 50 per cent allowable depletion level. The amount of water to be applied can be determined from soil moisture sampling. This amount should bring soil moisture conditions to the 50 per cent allowable depletion level to ensure that sufficient room is left in the root zone for any precipitation that falls over winter.

Irrigation Management Information

For further information regarding irrigation management of hard red spring wheat, contact your nearest Irrigation Branch office. These offices are located at: Lethbridge, 381-5136; Vauxhall, 654-2161; Airdrie, 948-8511; Taber, 223-7908; Strathmore, 934-3356; Brooks, 362-1212; Bow Island, 545-2231; Medicine Hat, 529-3616. North of Calgary, contact the Airdrie office or your local district agriculturist for assistance.

Growth and development of hard red spring wheat



GROWTH PERIODS	TILLERING	STEM EXTENSION	FLOWERING	RIPENING
POST EMERGENCE DATES	25 - 30 DAYS	45 - 55 DAYS	70 - 80 DAYS	110 - 115 DAYS
CROP * ROOT DEPTH	1.0cm/DAY	2.5cm/DAY	MINIMAL ROOT EXTENSION	
MOISTURE SENSITIVE PERIOD**	[Hatched Box]		[Hatched Box]	
AVERAGE E.T.	1.0 - 3.5mm/DAY	3.5 - 6.5mm/DAY	6.5 - 7.5mm/DAY	<7.5mm /DAY

* Maximum rooting depth will occur approximately by the time flowering begins.

** For optimum production, the first irrigation will be required before the crop enters into its water sensitive period. The above times, depth and amounts are only average values for this particular crop. These values will change depending on the variety and area where this crop is grown.

Soil

Soils can vary greatly in texture from being very fine (clay) to very coarse (sand) within a crop root zone. Because soil texture can change quite quickly, so can the amount of water that the soil is able to hold.

Texture	Available Moisture
Loamy sand	8-12 mm/0.1m (0.9-1.4 in./ft)
Sand loam	10-15 mm/0.1m (1.2-1.8 in./ft)
Loam	14-18 mm/0.1m (1.7-2.1 in./ft)
Sand clay loam, clay loam, clay	15-20 mm/0.1m (1.8-2.4 in./ft)
Silty clay loam, silt loam	16-22 mm/0.1m (1.9-2.6 in./ft)

It is important to know and to be able to calculate the amount of moisture present in the soil root zone in order to understand the amount of moisture available for crop use. The allowable depletion level is the amount of soil moisture that can safely be removed from the root zone by a crop before an irrigation is required. For hard red spring wheat, the allowable depletion level has been determined to be 50 per cent. The simplest way to determine soil moisture content is by the "feel" method. By feeling, squeezing and observing a handful of soil, one can determine the amount of moisture present in the soil. The following chart outlines the various characteristics of soil based on different contents of water.

	PERCENT OF AVAILABLE MOISTURE REMAINING	Feel or Appearance of Soils		
		MODERATELY COARSE TEXTURE	MEDIUM TEXTURE	MODERATELY FINE TEXTURE
DO NOT IRRIGATE	At field capacity 100	Upon squeezing no free water appears on soil but wet outline of ball is on left hand.	Same as sandy loam.	Same as sandy loam.
	75 to field capacity	Forms a weak ball, breaks easily, will not slide.	Forms a ball and is very pliable; slicks readily if relatively high in clay.	Easily ribbons out between fingers, has a slick feeling.
IRRIGATE SPEC. CROPS	50 to 75	Tends to ball under pressure but seldom will hold together	Forms a ball; somewhat plastic; will sometimes slick slightly with pressure.	Forms a ball, will ribbon out between thumb and forefinger.
IRRIGATE	25 to 50	Still appears to be dry, will not form ball with pressure.*	Somewhat crumbly but will hold together from pressure.	Somewhat pliable, will ball under pressure.
	0 to 25	Dry, loose, single-grained, flows through fingers.	Powdery, dry, sometimes slightly crusted but easily breaks down into powdery condition.	Hard, baked, cracked; sometimes has loose crumbs on surface.

* Ball is formed by squeezing a handful of soil firmly.